

UNCLASSIFIED

AD NUMBER

AD216382

LIMITATION CHANGES

TO:

Approved for public release; distribution is unlimited. Document partially illegible.

FROM:

Distribution authorized to U.S. Gov't. agencies and their contractors;
Administrative/Operational Use; DEC 1958. Other requests shall be referred to Walter Reed Army Medical Center, Washington, DC. Document partially illegible.

AUTHORITY

AMBRL ltr, 2 Jun 1967

THIS PAGE IS UNCLASSIFIED

UNCLASSIFIED

**A
D 216382**

Armed Services Technical Information Agency

**ARLINGTON HALL STATION
ARLINGTON 12 VIRGINIA**

**FOR
MICRO-CARD
CONTROL ONLY**

1

OF

1

NOTICE: WHEN GOVERNMENT OR OTHER DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE U. S. GOVERNMENT THEREBY INCURS NO RESPONSIBILITY, NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERE TO.

UNCLASSIFIED

BEST

AVAILABLE

COPY

216382

NO. 10
ASTIA FILE COPY

FILE COPY
Return to
ASTIA
ARLINGTON HALL STATION
ARLINGTON 12, VIRGINIA
ATTN: TRES

Report NO. TR-1528

U. S. Army Prosthetics Research Laboratory
Walter Reed Army Medical Center
Washington 12, D. C.

FORGIVE EXPORT LAMINATE EVALUATION

**FC
BAC**

James T. Hill
Pvt. William C. Williams

Approved by: _____
Chief, Prostheses Dev. Branch

Approved by: John B. Bawley JCB
For Director

Part VII, Effect of Drying Time on Laminated Properties

ASTIA
RECEIVED
MAY 26 1958
JWPR

III. RESULTS

The ILS data are plotted in Fig. 1 and listed in Table II. It may be seen that the highest effective porosities were obtained at 70°C. The highest ILS data was obtained at 100°C. The physical properties of the laminates are listed in Table II.

Impact

Since samples A and B (70° cure) were the only two laminates in this series, it is difficult to reach any definite conclusions concerning the effect of curing time on their properties. However, there is an indication that a certain effective stress may be obtained by curing between 1 and 3 hours, possibly at 2 hours. The 70°C series will be completed in the future.

Sample F (120 minute cure) in the 80°C series shows the best compressive strength. It is interesting to note that this sample also was cured for 2 hours. Almost all of our "standard" laminates have been cured under conditions similar to sample F's. Of all the samples tested, this one had the highest compressive characteristics. However, in the 100° series, the 1 hour sample had the more favorable compressive properties. This is probably due to the high curing temperature; the 2 hours being too long at such a high temperature.

Residual Stress

Again in the 70° series, due to incomplete results, no definite conclusion can be derived. However, generally it can be stated that the best results should be obtained between 1 and 2 hours.

In the 80° series the 1 hour cure appears to have more favorable physical properties, but since the effective porosity is only half that of the 2 hour cure, the 2 hour cure again may be considered the most desirable. In the 100°C series the 1 hour cure proved to give the best result.

Residual Stress

Samples A (70° x 60 minutes) and I (100° x 30 minutes) gave similar impact results, although they are at the extremes of porosities, sample A having a porosity of 13% and sample I with 11%. Both of these samples showed high impact resistance. Previous experiments have shown that the laminates with higher porosities give higher impact resistances. This trend was observed in these experiments.

I. INTRODUCTION

The purpose of this report is to describe the physical properties of a new type of laminate made from a mixture of PVA and nylon. The laminate is made by curing a mixture of PVA and nylon in a mold. The physical properties of the laminate are described in this report.

The laminate is made by curing a mixture of PVA and nylon in a mold. The physical properties of the laminate are described in this report.

II. MATERIALS

The materials used in this experiment were PVA and nylon. The PVA was of the type 100, and the nylon was of the type 6/6. The materials were mixed in a ratio of 1:1 by weight. The mixture was then cured in a mold at 70°C for 2 hours. The physical properties of the laminate are described in this report.

The laminate was made by curing a mixture of PVA and nylon in a mold.

Sample	Cure Temp (°C)
A	70
B*	70
C	70
D*	70
E	80
F	80
G	80
H*	80
I	100
J	100
K	100
L	100

*Samples B, D and H were discarded because of defects.

At high porosities, the laminate is so resilient that it collapses under a relatively light load. On the other hand, a laminate will become more susceptible to an earlier craze or crack when the effective porosity is low.

IV. CONCLUSIONS

1. The compressive stress at buckle of the laminate is not significantly affected by curing temperature or curing times over the range tested. Therefore, the effective porosity should be the controlling factor to be considered when choosing curing conditions with respect to compressive properties.

2. The bearing stress at 4% elongation, like compressive stress, does not appear to be significantly affected by curing conditions over the range tested. Again, the effective porosity appears to be the controlling factor.

3. The impact resistance like bearing and compressive strength is controlled by effective porosity rather than curing conditions over the range tested. As a result of these tests we make a general conclusion that the laminates may be completely cured at a temperature of 70°C or higher after a minimum precure of 60 minutes. The best conditions for curing, taking into account effect porosity and physical properties, appear to be 70°C for 120 minutes. Longer or higher temperatures tend to cause discoloration of the laminates.

V. RECOMMENDATION

1. An addenda to the Link Shop procedure (T.R. #5840) for fabrication of porous laminated arms should be prepared. This addenda should contain a recommendation stating the use of a 70°C cure instead of the 80°C cure now in use.

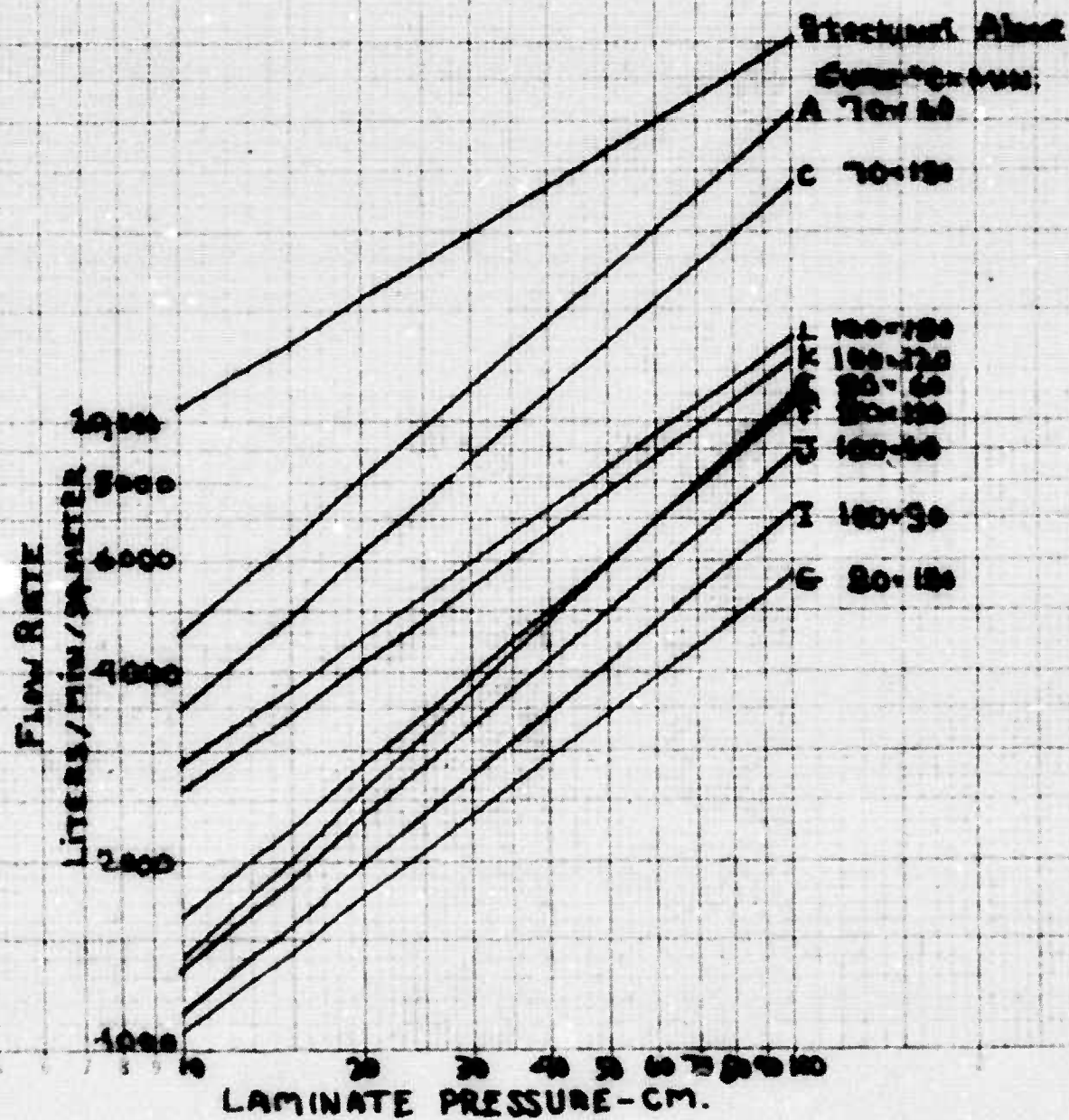
TABLE II

Sample	Cure Temp (°C)	Cure Time (min.)	COMPRESSION		TENSILE		IMPACT		Effective Porosity (%)
			Stress at Buckle (psi)	Strain (in/in)	Breaking Stress (psi)	Ult. Stress (psi)	Initial Crack (in. lbs)	Collapse (in. lbs)	
A	70	60	354	.0109	1011	10,366	12	15	60.4
C	70	180	804	.013	1133	4,666	18	21	46.2
E	80	60	312	.006	1656	6,083	15	18	20.3
F	80	120	1407	.015	2153	8,230	15	21	21.2
G	80	180	1262	.013	3500	10,000	15	18	12.4
I	100	30	763	.009	2519	7,244	12	15	12.3
J	100	60	863	.004	2461	8,076	18	21	17.7
K	100	120	519	.023	2366	8,630	15	21	26.4
L	100	180	737	.0109	1111	5,105	15	18	30.4

TR 5328

FIG. 1

EFFECT OF CURING CONDITIONS ON FLOW RATE



DISTRIBUTION LIST

Commanding General
U. S. Army Medical Research & Development Command
Department of the Army
Main Army Building
Washington 25, D. C.
(3 copies)

Contr., A.S.T.I.A.
Arlington Hall Station
Arlington 12, Virginia
(10 copies)

Coordinator for Foreign Liaison
Medical Intelligence and Information Division
Office of the Surgeon General
Department of the Army
Main Army Building
Washington 25, D. C.
(3 copies)

National Library of Medicine
7th and Independence, S.W.
Washington 25, D. C.

The New York Academy of Medicine
2 East 103rd Street
New York 29, New York
(ATTN: Librarian)

The Johns Hopkins University
Welch Medical Library
1900 East Monument Street
Baltimore 5, Maryland

Colonel Carl J. Murphy
Asst. Executive Director
Prosthetics Research Board
Suite 204, 4671 Wilshire Boulevard
Beverly Hills, California (10 copies)

V. A. Prosthetics Center
252 Seventh Avenue
New York 1, New York
(2 copies)

Prosthetic Devices Studies
NYU College of Engineering
252 Seventh Avenue
New York 1, New York